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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/054,938	01/25/2002	Hiroshi Kanazawa	218844US2SRD	6948

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OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER	
YOUNG, DONALD G	

ART UNIT	PAPER NUMBER
2654	

DATE MAILED: 08/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/054,938	KANAZAWA ET AL.	
	Examiner	Art Unit	
	Donald Young	2654	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 January 2002*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Drawings

2. The drawings of: Fig. 7, element S13; Fig. 12, element S25 are objected to because they both contain a misspelling of the word "spectrum." Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

3. The disclosure is objected to because of the following informalities: Related case 10/387,580 is not listed in the specification under the sub-heading of Cross-Reference to Relate Applications. Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at

the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. **Claims 1-14** are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi (USPN 6,044,341) and in view of Arslan et al. (5,706,395).

Regarding claims 1 and 8, Takahashi discloses a method and apparatus of suppressing noise components contained in an input speech signal, comprising:

- obtaining an input spectrum by executing frequency (spectrum) analysis of the input speech signal by a specific (predetermined) frame length (col. 7, lines 38-50);
- obtaining an estimated noise spectrum by estimating a spectrum of the noise components (col. 7, lines 51-55);
- multiplying (product) the estimated noise spectrum by a specific spectral subtraction coefficient determined by the spectral slope (The reference implicitly teaches use of the slope in determining the value of the spectral subtraction coefficient. For based on the number of frequency components whose amplitudes are negative, the subtraction coefficient-setting unit subtracts a nominal value from the coefficient (SC). The process is iterated until the number of frequency components whose amplitudes are negative is less than a predetermined number. Since the number of negative amplitudes inherently is a function of noise spectral slope, it determines the value of the subtraction coefficient) and

obtaining a subtraction spectrum by subtracting the estimated noise spectrum multiplied with the spectral subtraction (predetermined) coefficient from the input spectrum (Fig. 9, steps 29-32; col. 11, lines 33-57);

- obtaining a speech spectrum by clipping (half wave rectification) the subtraction spectrum (Examiner interprets the limitation of clipping as a process for avoiding the speech spectrum from assuming a negative value)(col. 11, lines 44-62).

Takahashi fails to disclose of correcting the speech spectrum by smoothing in at least one of frequency and time domain. However, Arslan et al. disclose a method of correcting the speech spectrum by smoothing in at least one of frequency and time domain (Fig. 3; col. 8, lines 14-16). Therefore, it would have been obvious to one of ordinary skill in the art at the time of applicant's invention to supplement Takahashi's method for suppressing noise with Arslan et al.'s method of smoothing to reduce noise fluctuations in the speech signal, as taught by Arslan et al. (col. 8, lines 25-26).

Regarding claim 2 and 4, Takahashi fails to disclose of smoothing the speech spectrum using neighboring speech spectrum elements and convoluting the speech spectrum using a specific function in at least one of the frequency and time domains. However, Arslan et al. disclose a method of smoothing the speech spectrum using neighboring speech spectrum (frequencies) elements and convoluting the speech spectrum using a specific function ($W(\omega)$) in at least one of the

frequency and time domain (The function of **Y(ω)** implies that the method of smoothing is occurring in the frequency domain, col. 8, lines 13-20).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of applicant's invention to supplement Takahashi's method for suppressing noise with Arslan et al.'s method of smoothing to reduce noise fluctuations in the speech signal, as taught by Arslan et al. (col. 8, lines 25-26).

Regarding claim 3, Takahashi fails to disclose of substituting speech spectrum elements with a max value of the neighboring speech spectrum elements. However, Arslan et al. disclose a method wherein correcting (smoothing) the spectrum includes substituting the speech spectrum elements by a maximum value of the neighboring (adjacent) speech spectrum elements (frequencies) (See col. 8, lines 35-50 wherein the transfer function disclosed in line 45 illustrates a maximum value substitution) (col. 8, lines 35-50).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to integrate Takahashi's method for smoothing during noise suppression with Arslan et al.'s substitution of a maximum value of the neighboring speech elements to reduce the variance of spectral estimation for noisy frames, as taught by Arslan et al. (col. 8, lines 26-27).

Regarding claim 5 and 12, Takahashi discloses a method and apparatus of suppressing noise components contained in an input speech signal comprising:

- obtaining indirectly a spectral slope of the estimated noise spectrum (The reference does not explicitly disclose of obtaining the spectral slope however, the slope is a determining factor in the estimation of the noise spectrum, Fig. 5, step S9; Col. 8, lines 55-60).

The remainder of claim 5 recites the same or similar limitation as claim 1 above, and so is rejected for the same reasons.

Regarding claim 6, Takahashi indirectly discloses a method of suppressing noise components contained in an input speech signal, comprising:

- a smaller spectral subtraction coefficient being set with an increasing spectral slope (A flattened noise spectrum increases the number of negative values than does a noise spectrum with a smaller (r). Takahashi teaches that the subtraction coefficient is decreased if the number of negative amplitude components is larger than a predetermined threshold number. Therefore, a noise spectrum with a large number of negative amplitude components has an increasing spectral slope (r). See col. 11, lines 44-57).

Regarding claim 7, claim 7 recites the same or similar limitation as claim 2 above, and so is rejected for the same reasons.

Regarding claim 9, claim 9 recites the same or similar limitation as claim 2 above, and so is rejected for the same reasons.

Regarding claim 10, claim 10 recites the same or similar limitation as claim 3 above, and so is rejected for the same reasons.

Regarding claim 11, claim 11 recites the same or similar limitation as claim 4 above, and so is rejected for the same reasons.

Regarding claim 13, claim 13 recites the same or similar limitation as claim 6 above, and so is rejected for the same reasons.

Regarding claim 14, claim 14 recites the same or similar limitation as claim 2 above, and so is rejected for the same reasons.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Crozier et al. (5,742,927) teach of a noise reduction apparatus and method for enhancing noisy speech signals, which apply to the spectral component signals of a time-varying input signal either a spectral subtraction process or a spectral scaling process followed by signal attenuation in regions of the frequency spectrum lying between identified formant regions.

Gustafsson et al. (6,175,602) teach of a method and apparatus for a noise reduction system that includes spectral subtraction algorithms using linear convolution, causal filtering and/or spectrum dependent exponential averaging of the spectral subtraction gain function.

Lockwood et al. (6,477,489) disclose a method for noise suppressing in digital speech signals that includes two subtraction steps wherein the result of the spectral subtraction is transformed into the time domain to construct a noise-suppressed speech signal.

Weintraub et al. (6,804,640) disclose a method and apparatus for generating a noise-reduced feature vector representing human speech.

A signal-to-noise ratio is determined for the frequency index. A scale factor is computed for the frequency index. The noise magnitude estimate is then scaled by the scale factor. The scaled noise magnitude estimate is subtracted from the spectral magnitudes of the filtered speech data, to produce cleaned speech data.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Donald Young whose telephone number is (571) 272-8134. The examiner can normally be reached on 8:30 a.m. to 5:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Talivaldis Smits can be reached on (571) 272-7628. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

8. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Donald Young
Examiner
Art Unit 2654

08/05/05

RICHEMOND DORVIL
SUPERVISORY PATENT EXAMINER